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Waisanen et al.

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(54) **WORK PLATFORM FOR AN OVERHEAD CRANE**

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B66C 17/06	(2006.01)
B66F 11/04	(2006.01)

(52) **U.S. Cl.**

CPC ***B66C 17/06*** (2013.01); ***B66C 17/00*** (2013.01); ***B66F 11/04*** (2013.01); *Y10T 29/49* (2015.01)

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CPC E04G 3/22; E04G 3/28; E04G 2003/286; E01D 19/106; B62D 57/00; B66F 11/04; B60P 1/6445; B66C 17/00; B66C 17/06

USPC 182/69.4, 69.6, 141; 212/74, 270, 328, 212/329, 336, 343; 414/146

See application file for complete search history.

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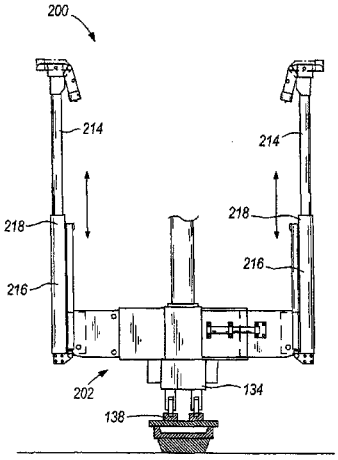
(57) **ABSTRACT**

A work platform for use in performing maintenance while supported on an overhead crane. The work platform is particularly useful for performing maintenance on an overhead cranes located in areas where normal lifting equipment and/or scaffolding cannot easily access the overhead crane. However, the work platform is also useful for performing maintenance on equipment and/or structures in the vicinity of overhead cranes, and on overhead cranes located in areas without accessibility problems. The work platform is hoisted for placement on the support structure of the overhead crane by hoist apparatus of the overhead crane. When positioned, the work platform may be fully supported on the support structure of the overhead crane.

5 Claims, 11 Drawing Sheets



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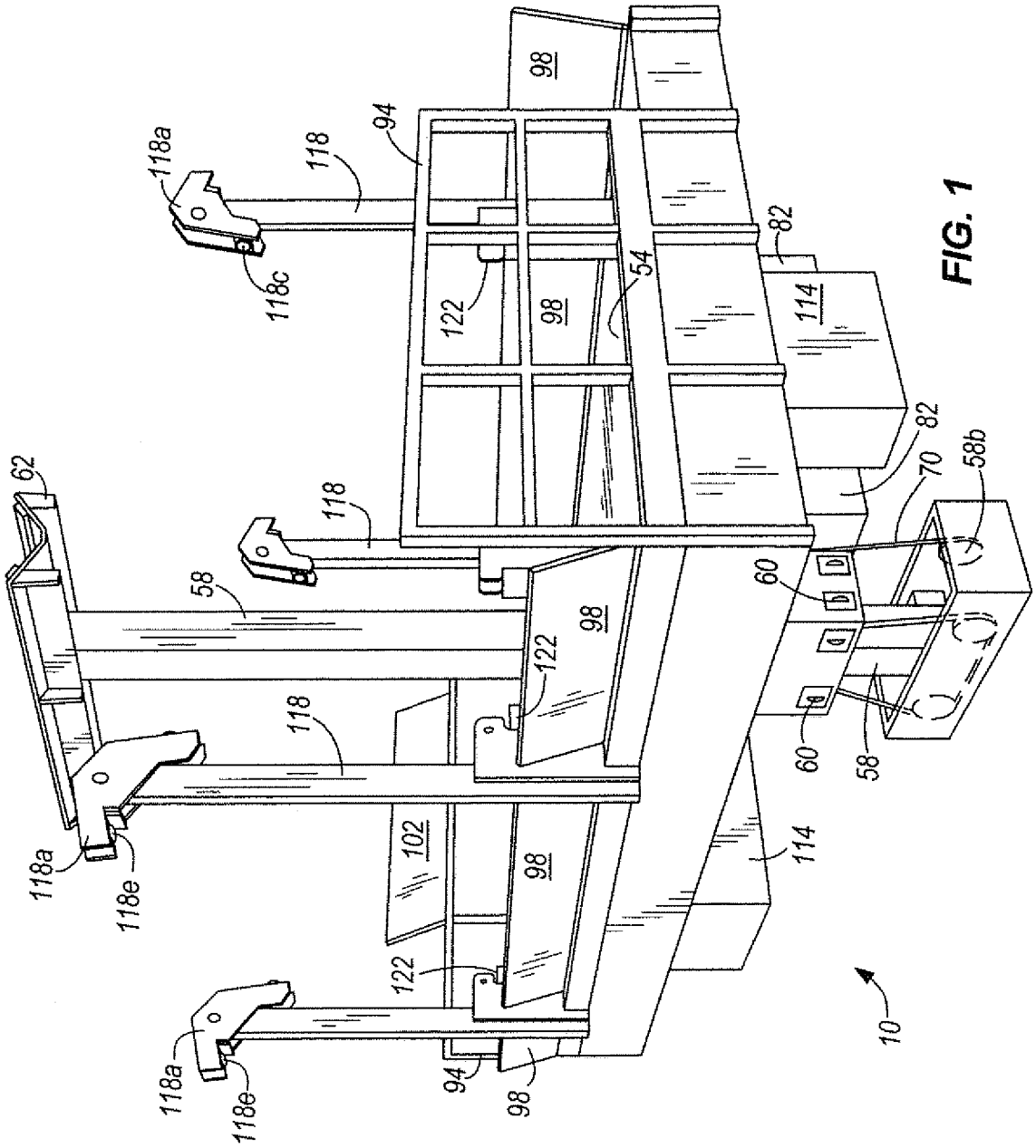
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FIG. 1

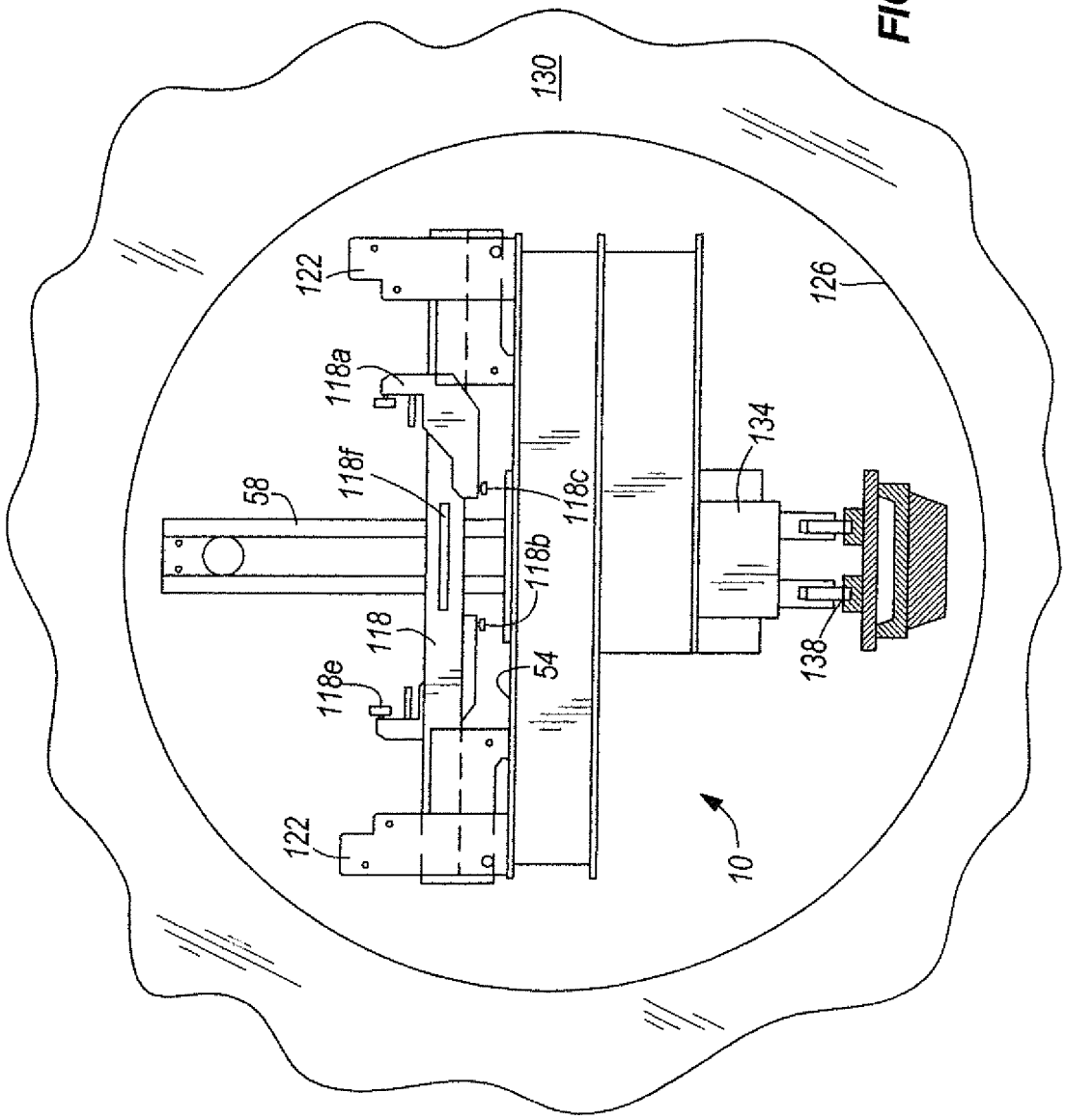

FIG. 2

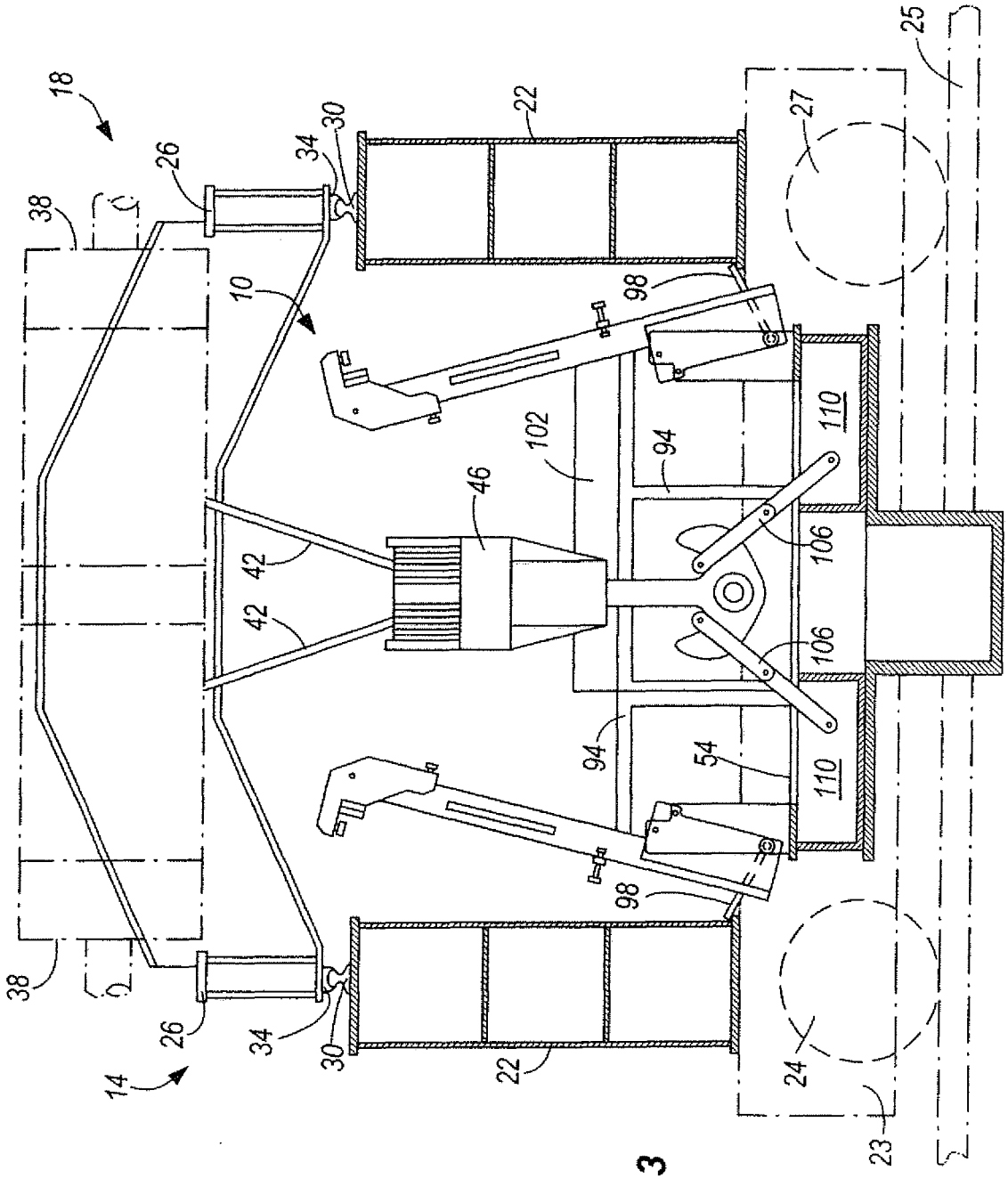
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FIG.3

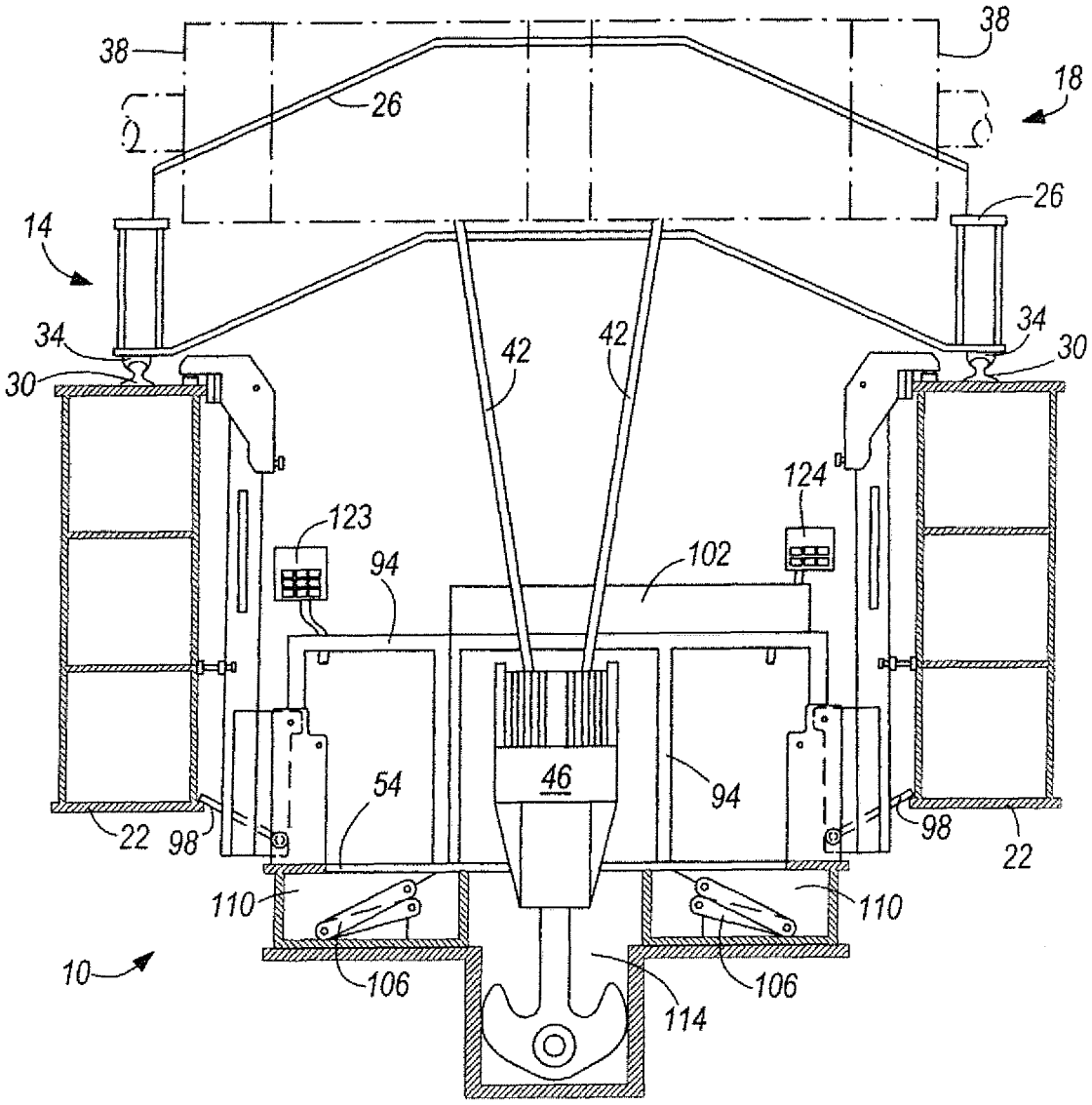
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FIG. 4

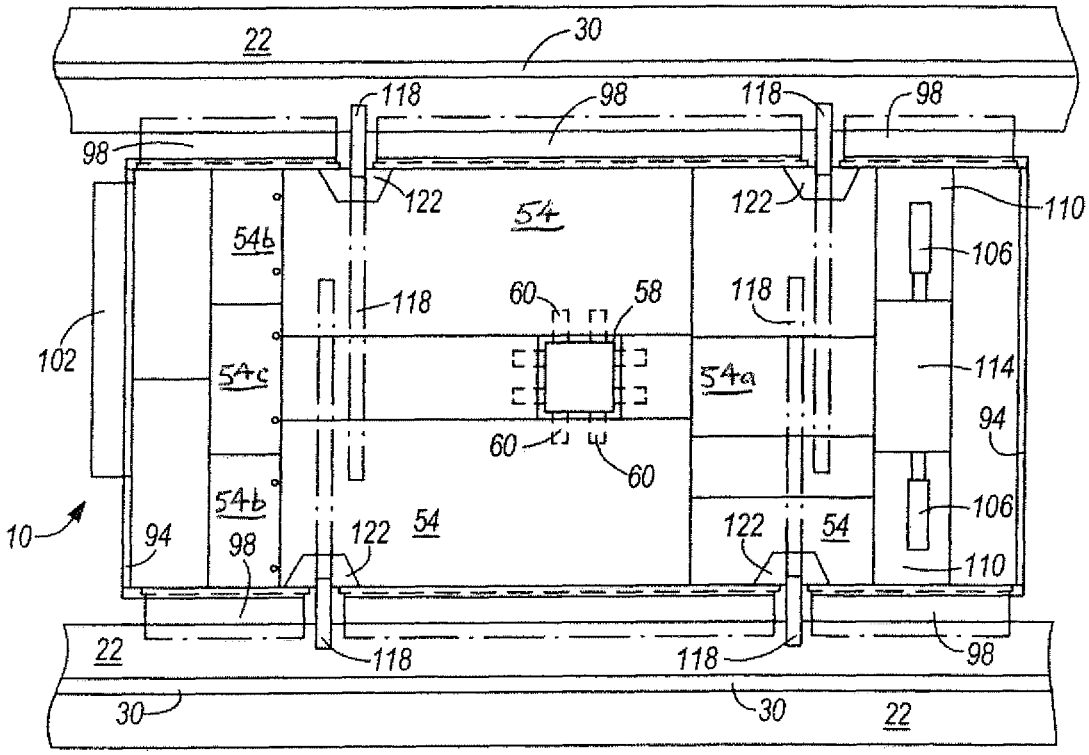
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FIG. 5

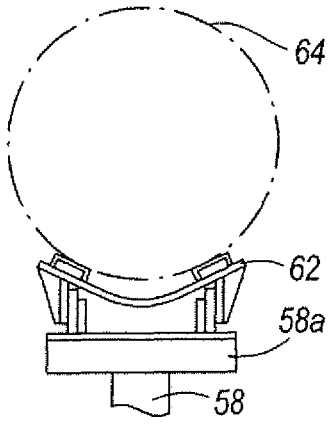
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FIG. 9

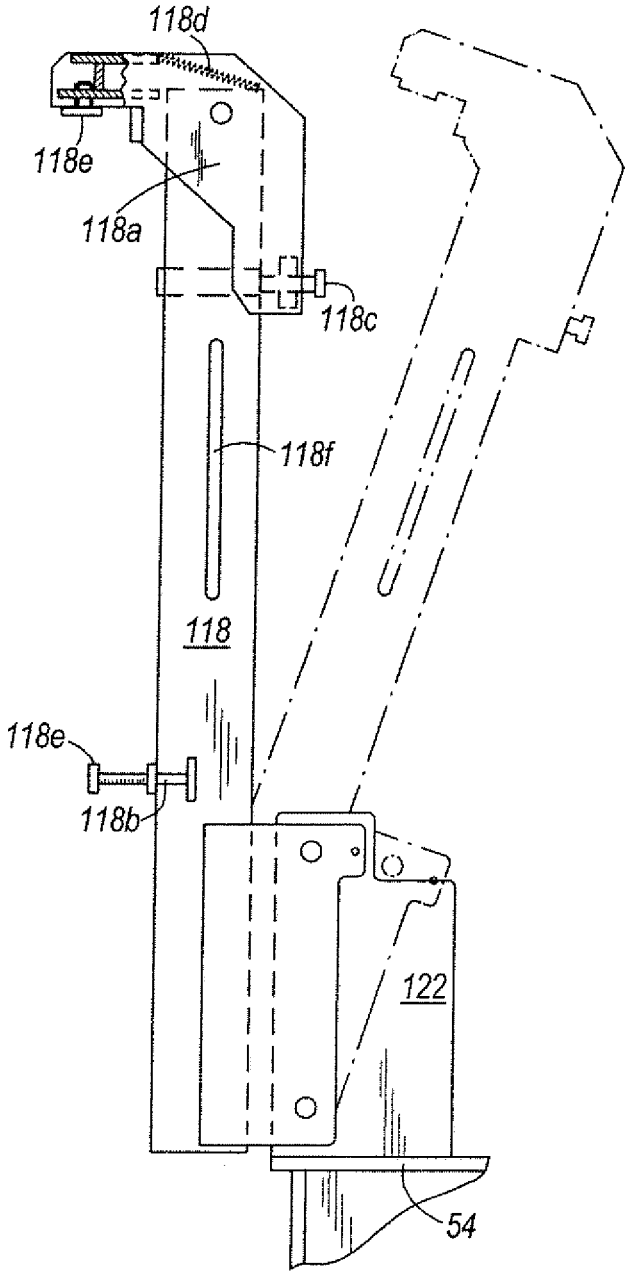
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FIG. 6

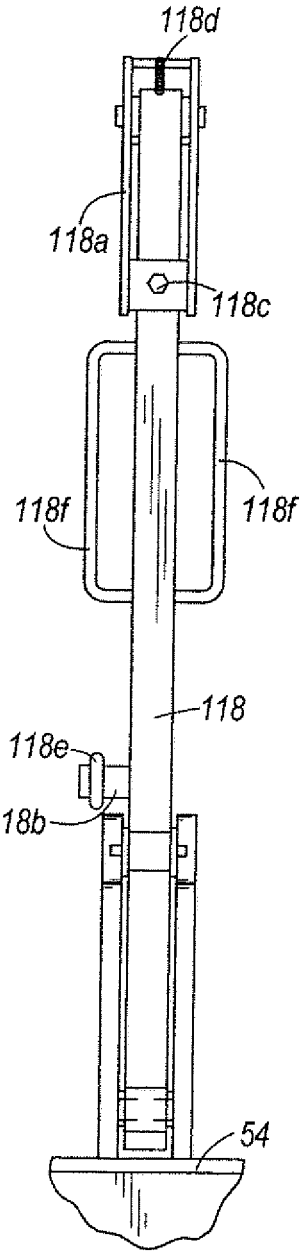
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FIG. 7

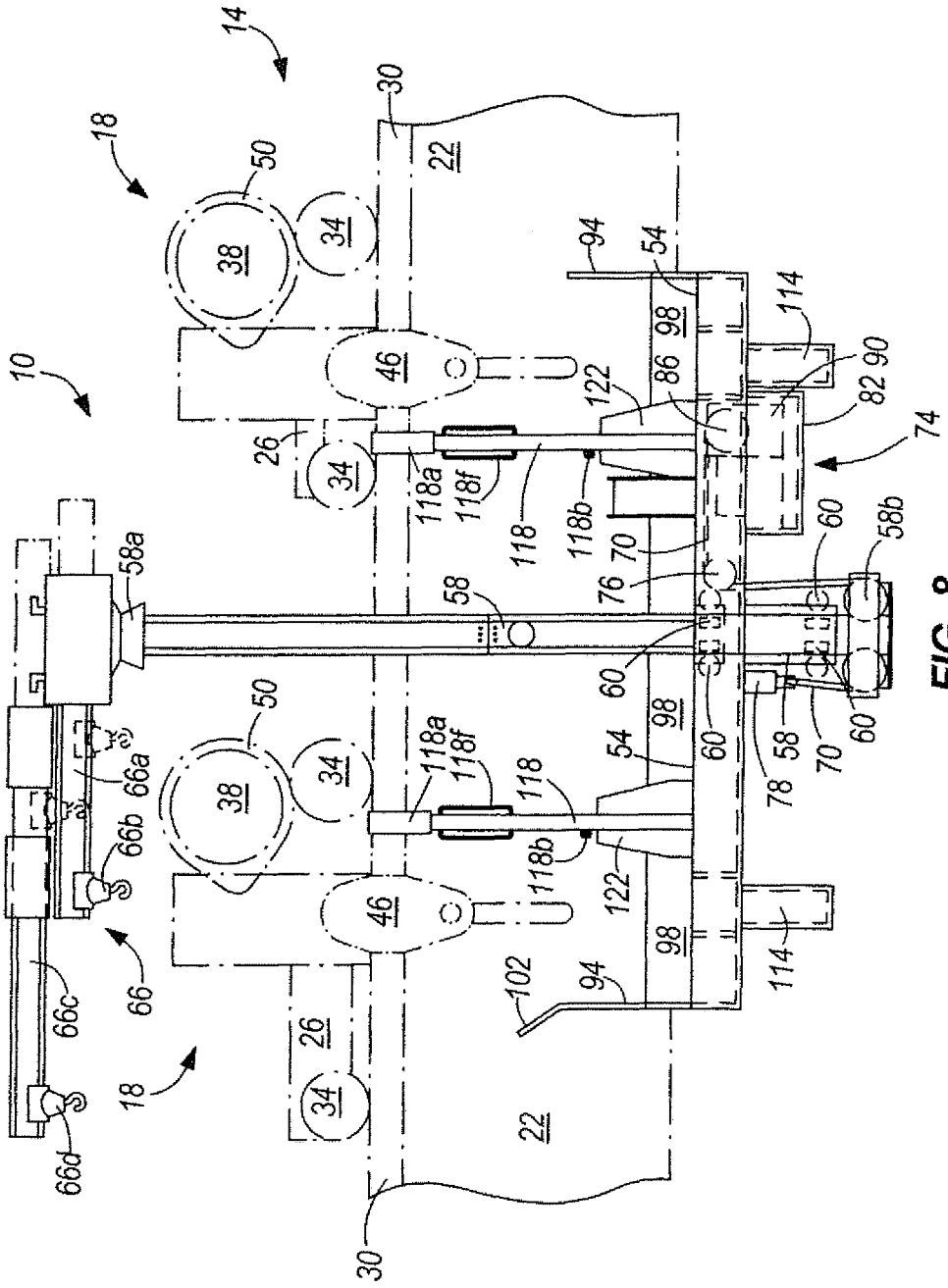
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FIG. 8

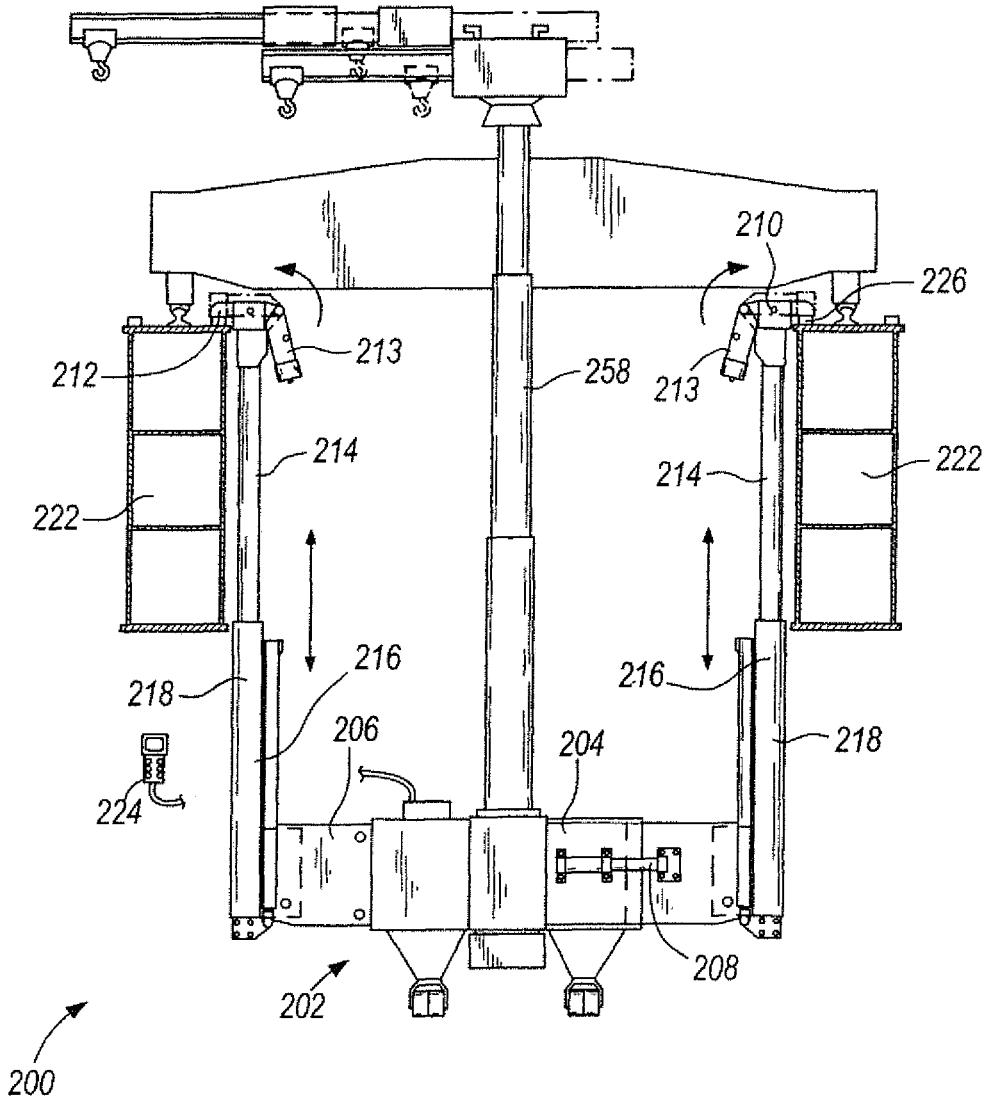
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FIG. 10

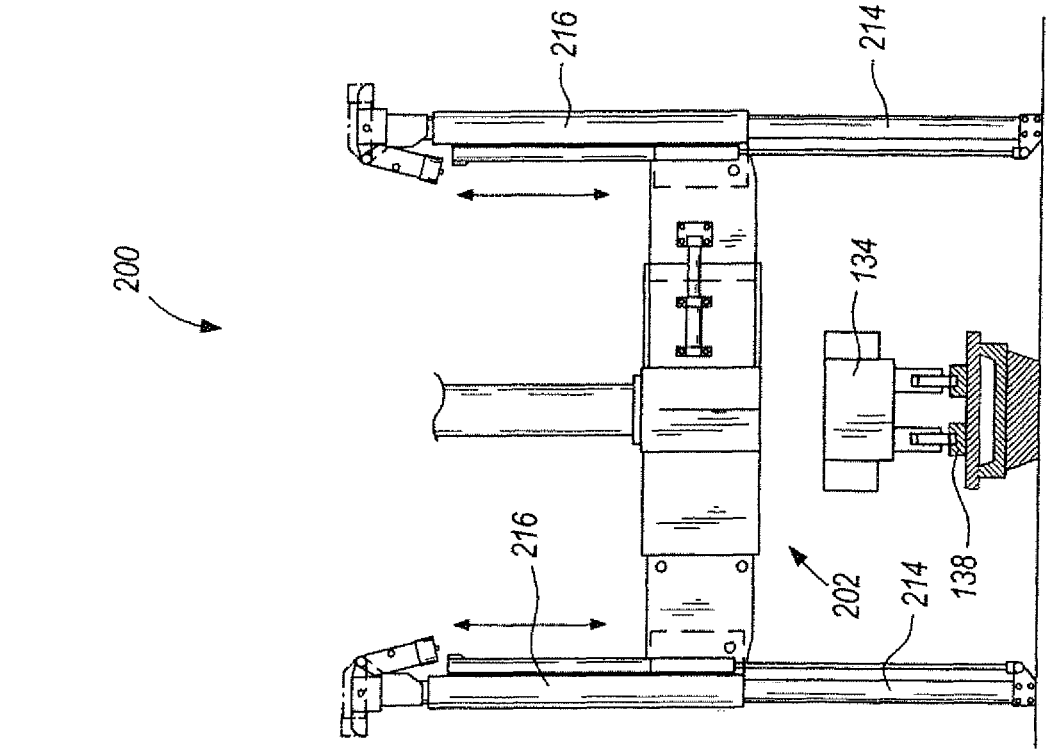
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FIG. 12

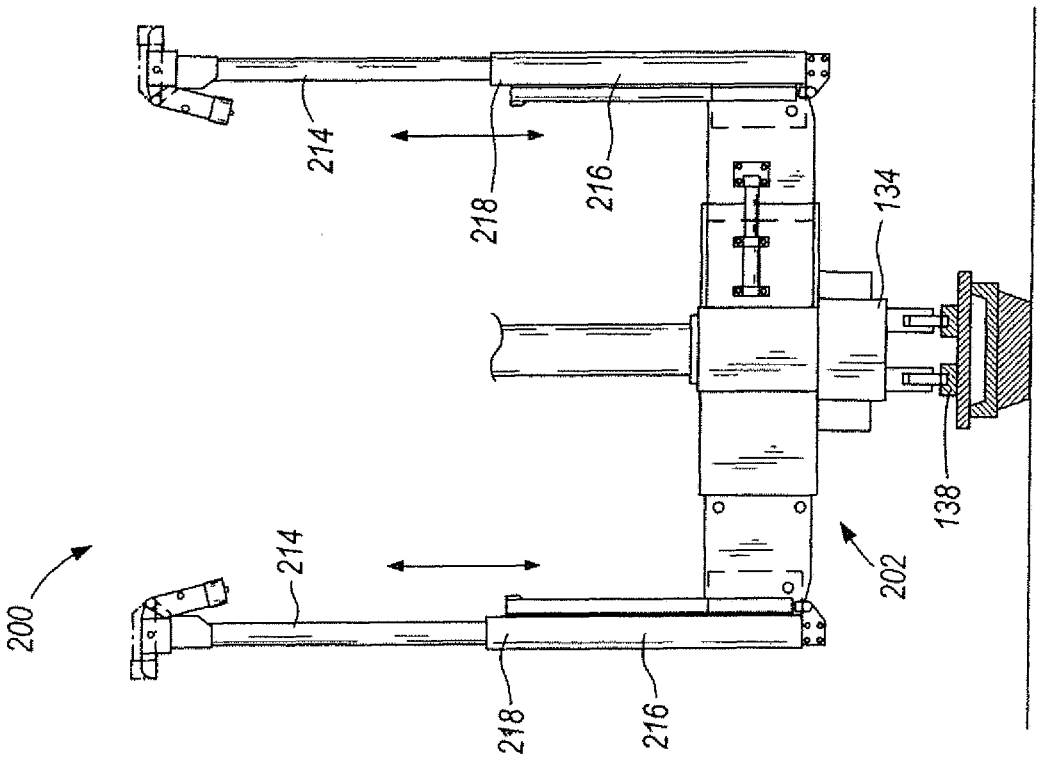
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FIG. 11

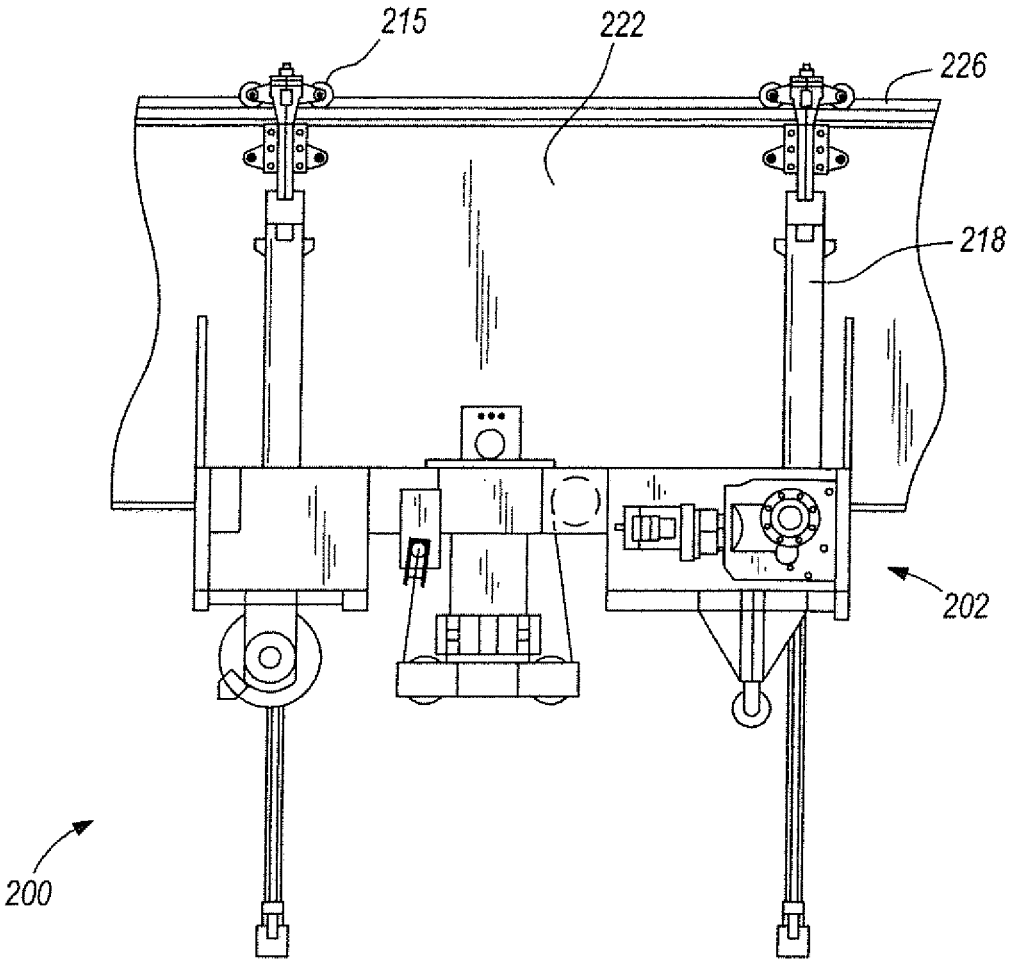

FIG. 13

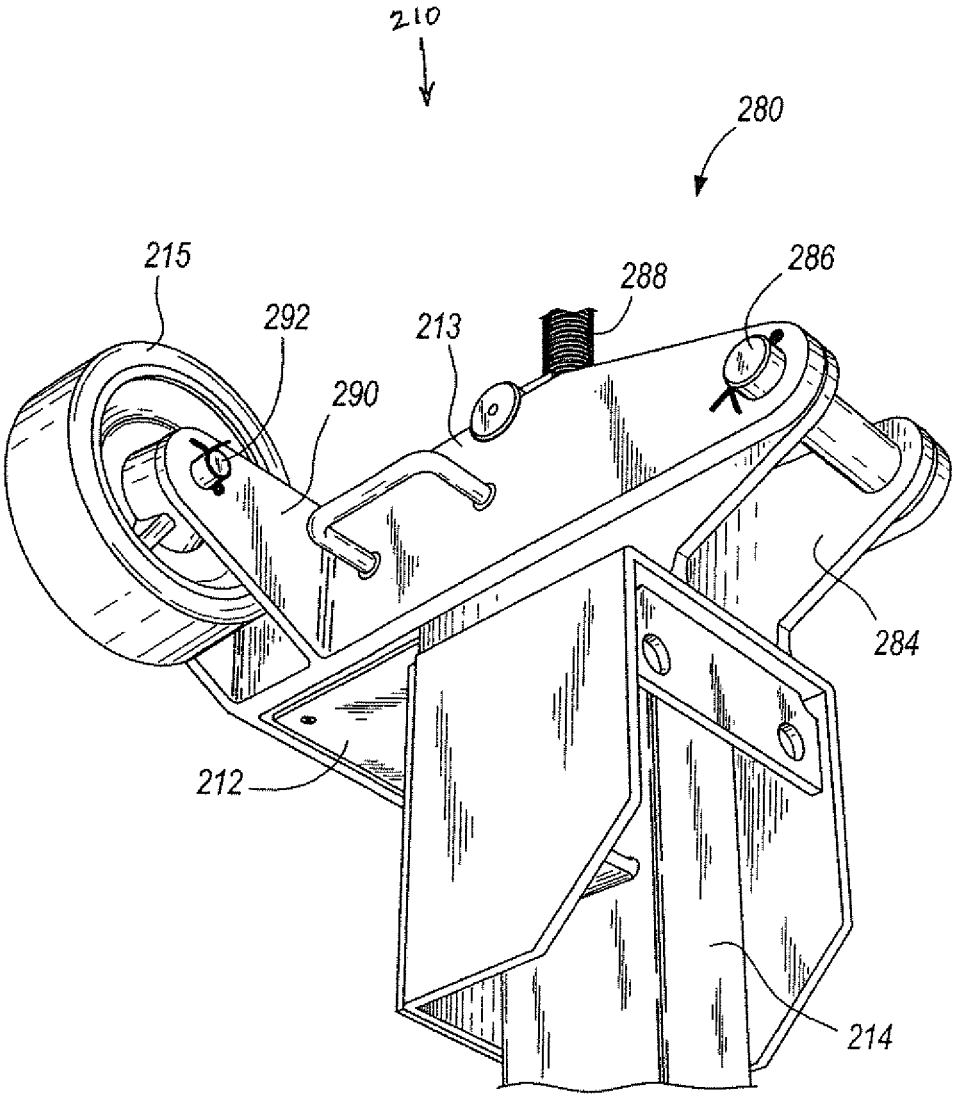

FIG. 14

WORK PLATFORM FOR AN OVERHEAD CRANE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a divisional of U.S. patent application Ser. No. 11/075,078 filed on Mar. 8, 2005, which is a continuation-in-part of PCT Application Number PCT/US04/28753 filed on Sep. 3, 2004 and PCT Application Number PCT/US03/27887 filed on Sep. 5, 2003, the disclosures of which are expressly incorporated herein in their entireties by reference.

FIELD OF THE INVENTION

The invention relates to overhead cranes, and more particularly, to the performance of maintenance on overhead cranes.

BACKGROUND OF THE INVENTION

It is often necessary to erect scaffolding and/or utilize lifting equipment when performing maintenance (e.g., repair, inspection, cleaning, modernization, and the like) on overhead cranes, and equipment and/or structures in the vicinity of overhead cranes. Erection of scaffolding and/or placement of lifting equipment can be time consuming and dangerous for maintenance personnel. This is especially prevalent in areas with limited access, such as containment buildings for atomic reactor power generating plants.

SUMMARY OF THE INVENTION

The invention provides work platforms for use in performing maintenance while supported on an overhead crane. The work platforms are particularly useful for performing maintenance on cranes located in areas where normal lifting equipment and/or scaffolding cannot easily access the crane. However, work platforms according to the invention are also useful for performing maintenance on equipment and/or structures in the vicinity of overhead cranes, and on overhead cranes located in areas without accessibility problems.

The work platform is hoisted for placement on the support structure of the overhead crane by at least one hoist apparatus of the overhead crane. When positioned, the work platform may be fully supported on the support structure of the overhead crane so the work platform can be utilized to perform an array of tasks, including, among others, the replacement or repair of portions of the overhead crane's hoist apparatus.

In one embodiment, the invention provides an overhead crane apparatus including an overhead crane and a work platform. The overhead crane includes a hoist apparatus operable to raise and lower a load, and a support structure that supports the hoist apparatus above the ground. The work platform is usable to perform maintenance while supported on the support structure. The work platform is capable of being lifted above the ground by the hoist apparatus. The work platform has a work surface sized to support at least one maintenance personnel for the performance of maintenance, and at least one support member that is connectable to the support structure when the work platform is supported by the hoist apparatus. The at least one support member is capable of supporting the work platform on the support structure independent of the hoist apparatus.

In another embodiment, the invention provides a method of performing maintenance while supported on an overhead crane. The overhead crane includes a hoist apparatus operable to raise and lower a load, and a support structure that supports the hoist apparatus above the ground. The method includes providing a work platform, lifting the work platform above the ground using the hoist apparatus, and connecting the work platform to the support structure when the work platform is supported by the hoist apparatus, such that the support structure supports the work platform above the ground for performance of maintenance. The work platform has a work surface sized to support at least one maintenance personnel for the purpose of the performance of maintenance. The work platform is capable of being supported on the support structure independent of the hoist apparatus.

In yet another embodiment, the invention provides a method of performing maintenance while supported on a polar reactor overhead crane positioned in a containment building. The containment building includes an equipment hatch for moving equipment in to and out of the containment building. The polar reactor overhead crane includes a hoist apparatus operable to raise and lower a load, and a support structure that supports the hoist apparatus above the ground. The support structure includes a pair of spaced apart, generally parallel girders, and a generally circular rail that supports the girders. The method includes providing a work platform, moving the work platform through the equipment hatch and into the containment building, lifting the work platform above the ground using the hoist apparatus, and connecting the work platform to the girders when the work platform is supported by the hoist apparatus, such that the support structure supports the work platform above the ground for the performance of maintenance. The work platform has a work surface sized to support at least one maintenance personnel for the performance of maintenance. The work platform is capable of being supported on the support structure independent of the hoist apparatus.

In still another embodiment, the invention provides a work platform for a crane having a hoist supported by a girder. The work platform includes a substantially horizontal base sized to support at least one person, and a suspension support. The suspension support is coupled to the base and removably engageable with the girder to temporarily couple the base to the girder. A coupling is attached to the base to which the hoist is connectable to allow the hoist to raise and lower the platform to and from a position wherein the suspension support can engage the girder.

In yet another embodiment, the invention provides a jib crane comprising a mast, a first boom, and a second boom. The first boom is pivotally coupled to an end of the mast and includes a first hoist movable on the first boom. The second boom is movably coupled to the first boom and includes a second hoist movable on the second boom.

In yet another embodiment, the invention provides an overhead crane apparatus comprising a hoist apparatus, a support structure, and a work platform. The hoist apparatus is operable to raise and lower a load and the support structure supports the hoist apparatus above the ground. The work platform is usable to perform maintenance while supported on the support structure and is capable of being lifted above the ground by the hoist apparatus. The work platform further includes at least one support member capable of supporting the work platform on the support structure independent of the hoist apparatus. The support member is movable along the support structure such that the work platform moves along the support structure.

In still another embodiment, the invention includes an overhead crane apparatus comprising a hoist apparatus, a support structure, and a work platform. The hoist apparatus is operable to raise and lower a load and the support structure

supports the hoist apparatus above the ground. The work platform has a base and is usable to perform maintenance while supported on the support structure. The work platform is capable of being lifted above the ground by the hoist apparatus and includes at least one support member that is connectable to the support structure. The support member is capable of supporting the work platform on the support structure independent of the hoist apparatus. The base of the work platform is movable up and down along the support member.

In another embodiment, the present invention provides a crane apparatus comprising a hoist apparatus, a support structure, and a work platform. The hoist apparatus is operable to raise and lower a load and the support structure comprises at least two girders spaced apart from each other and along which a trolley that supports the hoist apparatus above the ground moves. The work platform has a base and is usable to perform maintenance while supported on the support structure. The work platform is capable of being lifted above the ground by the hoist apparatus and includes at least one support member that is connectable to the girders. The support member is capable of supporting the work platform on the girders independent of the hoist apparatus. The base of the work platform is adjustable to correspond to the distance between the girders.

In yet another embodiment, the invention provides an overhead crane apparatus comprising a hoist apparatus, a support structure, a work platform, and a mast. The hoist apparatus is operable to raise and lower a load and the support structure supports the hoist apparatus above the ground. The work platform has a base and is usable to perform maintenance while supported on the support structure. The work platform is capable of being lifted above the ground by the hoist apparatus and includes at least one support member that is connectable to the support structure. The support member is capable of supporting the work platform on the support structure independent of the hoist apparatus. The mast extends substantially perpendicularly from the base.

In still another embodiment, the invention provides method of implementing a work platform for an overhead crane. The overhead crane includes a support structure that supports a hoist above the ground and the work platform includes a base and a first support member connected to the base and along which the base moves. The method includes moving the work platform on a car into a space serviced by the overhead crane, engaging the first support member with the ground around the car, and moving the base of the work platform along the first support member to lift the work platform off of the car.

Further objects of the present invention together with the organization and manner of operation thereof, will become apparent from the following detailed description of the invention when taken in conjunction with the accompanying drawings wherein like elements have like numerals throughout the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is further described with reference to the accompanying drawings, which show an embodiment of the present invention. However, it should be noted that the invention as disclosed in the accompanying drawings is illustrated by way of example only. The various elements and combinations of elements described below and illustrated in the drawings can be arranged and organized differently to result in embodiments which are still within the spirit and scope of the present invention. Also, it is understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms "mounted," "connected," "supported," and coupled" are sued broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, "connected" and "coupled" are not restricted to physical or mechanical connections or couplings.

FIG. **1** illustrates a perspective view of a work platform for use in performing maintenance while supported by an overhead crane.

FIG. **2** illustrates an elevation view of the work platform of FIG. **1** moving through an equipment hatch of a containment building.

FIG. **3** illustrates a sectional view of the work platform of FIG. **1** showing the work platform positioned in a hoisted position.

FIG. **4** illustrates a view similar to FIG. **3** showing the work platform positioned in a maintenance performing position.

FIG. **5** illustrates a top view of the work platform of FIG. **1** positioned in a maintenance performing position.

FIG. **6** illustrates a side view of a suspension support of the work platform of FIG. **1**.

FIG. **7** illustrates a rear view of the suspension support of FIG. **6**.

FIG. **8** illustrates a side view of the work platform of FIG. **1** with a jib crane attachment installed.

FIG. **9** illustrates a drum cradle attachment that can be installed on the work platform of FIG. **1**.

FIG. **10** illustrates another embodiment of a work platform for use in performing maintenance while supported by an overhead crane.

FIG. **11** illustrates the work platform of FIG. **10** on an equipment hatch transfer car.

FIG. **12** illustrates the work platform of FIG. **10** lifted off of transfer car of FIG. **11** and standing on support members above the transfer car.

FIG. **13** illustrates a side view of the work platform of FIG. **10**.

FIG. **14** illustrates a perspective view of a portion of the work platform of FIG. **10**.

DETAILED DESCRIPTION OF CERTAIN PREFERRED EMBODIMENTS

The figures illustrate a work platform **10** according to one embodiment of the invention. The work platform **10** is illustrated and described as being utilized to perform maintenance while supported on a polar reactor overhead crane **14** (FIG. **3**). A polar reactor overhead crane is disclosed in each of U.S. Pat. Nos. 3,960,242, and 5,706,736. It should be understood that the work platform **10** of the present invention is capable of use in performing maintenance while supported on other overhead cranes, and the overhead crane **14** is merely shown and described as one such example.

The overhead crane **14** includes hoist apparatus **18** (FIG. **8**), and a pair of spaced apart, generally parallel girders or bridge cross-members **22** (FIGS. **3-5**). With reference to FIG. **3**, trucks **23** mounted at opposite ends of the girders **22** include drive wheels **24** rotatably mounted for engagement with circular rail **25**. The trucks **23** may also include non-driven or idler wheels **27** rotatably mounted for engagement with the rail **25**. The rail **25** is mounted on suitable foundation means. The trucks **23**, drive wheels **24**, rail **25**, and idler wheels **27** are schematically illustrated in FIG. **3** and may be

sized differently and/or positioned alternatively with respect to the girders **22** in actual constructions. Engagement of the drive and idler wheels **24** and **27** with the rail **25** supports the crane **14** and permits travel of the crane **14** along the rail **25**. Movement of the hoist apparatus **18** relative to the girders **22** in combination with movement of the girders **22** along the rail **25** allows the hoist apparatus **18** to access all areas within the containment building in which the crane **14** is operating. In other embodiments, the hoist apparatus **18** may be fixed relative to the girders **22** and/or the girders **22** may be fixed relative to the rail.

With reference to FIG. **8**, each hoist apparatus **18** is adapted to be supported on the girders **22** for movement relative to the girders **22**. More specifically, each hoist apparatus **18** includes a trolley or frame **26** that is supported fro travel on tracks or rails **30** by wheel assemblies **34**. The rails **30** are mounted on the girders **22** of the crane **14**. The hoist apparatus **18** also includes a hoist drum **38** mounted on the frame **26** for rotation about a drum axis. A hoist rope **42** (FIGS. **3** and **4**) is wound around the drum **38** such that the rope **42** winds on to and off of the drum **38** in response to rotation of the drum **38** in opposite wind-on and wind-ff direction, respectively.

The hoist apparatus **18** also includes a load engaging mechanism **46** connected to the rope **42**. The load engaging mechanism **46** includes a bottom block through which the rope **42** is reeved, and a hook depending from the bottom of the bottom block. As is known in the art, the load engaging mechanism **46** moves upward when the rope **42** winds on to the drum **38**, and moves downward when the rope **42** winds off of the drum **38**. The hoist apparatus **18** also includes a motor **50** that is mounted on the frame **26**. The motor **50** is connected to the drum **38** for selectively rotating the drum **38** in the opposite wind-on and wind-off directions. The hoist apparatus **18** as thus far described are conventional and need not be described in greater detail. The crane **14** is illustrated as including two host apparatus **18**. In other embodiments, the crane **14** may include fewer or more hoist apparatus **18**.

The work platform **10** is a structure that is temporarily attached to the girders **22** of the crane **14**. The work platform **10** functions as a work area for maintenance personnel that are performing maintenance on the crane **14** and/or on other equipment and/or structure in the vicinity of the crane **14**. The work platform **10** also functions as an installation tool in the performance of such maintenance. The work platform **10** is particularly useful for performing maintenance on the crane **14** because it is located in an area (i.e., a containment building) where normal lifting equipment and/or scaffolding cannot easily access the crane **14**. In other embodiments, work platforms according to the invention are also useful in performing maintenance in areas without accessibility problems.

The work platform **10** includes a generally horizontal work surface **54** (FIG. **5**) sized to support at least one maintenance personnel for performing maintenance. The illustrated work surface **54** is sized to support up to four maintenance personnel. In other constructions, the work surface **54** may be smaller or larger. The illustrated work surface **54** is coated with an anti-skid paint.

With reference to FIG. **5**, a mast **58** extends through the center of the work surface **54**. Guide rollers **60** allow the mast **58** to move vertically relative to the work surface **54**. The illustrated mast **58** is constructed in two portions to ease transport of the work platform **10**. The upper portion of the mast **58** (FIG. **8**) includes a rotating assembly **58***a*. A number of different attachments are connectable to the mast **58** for use in performing maintenance.

FIGS. **1** and **9** illustrate a drum cradle attachment **62**. The drum cradle attachment **62** is sized to handle hoist drum assemblies **64** (e.g., the drum **38**, the rope **42** wrapped on the drum **38**, gearing of the drum **38**, and the like). The drum cradle attachment **62** is fully rotatable when positioned on the rotating assembly **58***a*. In one construction, the rotating assembly **58***a* includes two sets of thrust bearings to provide such rotation. The drum cradle attachment **62** also includes a longitudinal adjustment feature to ease placement of the drum cradle attachment **62** with respect to a hoist drum assembly **64**, and to allow movement of the hoist drum assembly **64** relative to the mast **58** when the hoist drum assembly **64** is supported on the drum cradle attachment **62**. The drum cradle attachment **62** may be alternatively constructed in other embodiments.

FIG. **8** illustrates a jib crane attachment **66**. The jib crane attachment **66** is movable between a locked position, as shown in dotted lines on FIG. **8**, and a fully extended position, as shown in solid lines in FIG. **8**. The jib crane attachment **66** includes a two-beam design that eases movement of the jib crane attachment **66** relative to the crane **14**. The lower beam **66***a* includes a two-ton capacity hook **66***b* mounted on rollers. The upper beam or boom **66***c* includes a one-ton capacity chain hoist **66***d* mounted on rollers. the illustrated jib crane attachment **66** can extend up to approximately eighteen feet from the mast **58**. The jib crane attachment **66** may be alternatively constructed in other embodiments and may be connected, permanently or temporarily, to a portion of the overhead crane **14**, such as the girders **22** or trolley **26**.

In other embodiments, a worker basket attachment that supports movement of maintenance personnel relative to the work surface **54** may be connected to the mast **58**. The worker basket attachment may include both vertical and horizontal movement relative to the mast **58**. In constructions where the worker basket attachment is utilized to perform maintenance on equipment and/or structure in the vicinity of the crane **14** (e.g., sprayers located on the ceiling of the containment building), the crane **14** may be moved to reposition the worker basket attachment relative to the equipment and/or structure. In yet other embodiments, other types of attachments may be attached to the mast **58** to perform or assist in the performance of maintenance.

With reference to FIGS. **1** and **8**, the lower portion of the mast **58** includes a sheave assembly **58***b*. Rope **70** extending from a hoist unit **74** is reeved around redirection sheaves **76**, through the sheave assembly **58***b*, and to a dead ended assembly **78** mounted on the underside of the work platform **10**. The illustrated dead end assembly **78** includes two dead ends mounted to a load bar. The hoist unit **74** is mounted below the work surface **54** in a hoist unit compartment **82**. The hoist unit **74** includes a hoist drum **86** having the rope **70** wound there around in a double reeved configuration such that the rope **70** winds on to and off of the drum **86** in response to rotation of the drum **86** in opposite wind-on and wind-off directions, respectfully. The hoist unit **74** also includes a motor **90** that selectively rotates the drum **86** in the opposite wind-on and wind-off direction. The mast **58** moves upward when the rope **42** winds on to the drum **38**, and moves downward when the rope **42** winds off of the drum **38**. The illustrated mast **58** provides fourteen feet of vertical travel at ten feet-per-minute, and includes eleven tons of lift capacity.

The mast may be alternatively be a telescoping mast **258**, as shown in FIG. **10**. The telescoping mast **258** includes sections (**3**, as illustrated in FIG. **10**) that nest within one another and hydraulically extend relative to each other to provide extension of the mast without requiring the mast to extend below the base of the work platform, as is the case in the embodi-

ment of the work platform **10**, shown in FIGS. **1** through **8**. The mast **58** may alternatively be constructed in other embodiments.

With reference to FIG. **1**, the work platform **10** is equipped with lift-off handrails **94**. The hand rails **94** may include multiple removable segments to allow equipment or other objects to pass. In other embodiments, the handrail **94** may include a chain gate to allow equipment or other objects to pass. Further, the hand rail **94** may include a removable barrier to prevent objects from falling from the work platform **10**. In some constructions, the removable-barrier is see-through (e.g., acrylic).

With reference to FIGS. **1** and **3-4**, the work platform **10** includes wing plates **98** extending outward from the sides of the work surface **54**. A wing plate **102** is also positioned on a portion of the handrail **94**. The wing plates **102** prevent objects from falling from the work platform **10**. The illustrated wing plates **98** are pivotable, the wing plate **102** is fixed. In other embodiments, the work platform **10** may include fewer or more wing plates **98**, **102**, or other types of object deflectors.

With reference to FIGS. **3-5**, the work platform **10** includes hook linkages **106**. Each hook linkage **106** is mounted below the work surface **54** in a hook linkage compartment **110**. The hook linkages **106** fold away into respective hook linkage compartments **110** when not in use, and extend from the hook linkage compartments **110** for engagement by the load engaging device **46** of a respective hoist apparatus **18**. The work platform **10** includes two sets of hook linkages **106**. In other embodiments, the work platform **10** may include fewer or more sets of hook linkages **106**, or other types of hook attachments.

The work surface **54** includes a plurality of trap doors **54***a*, **54***b*, **54***c* to compartments (e.g., the hoist unit compartment **82**, the hook linkage compartments **110**) located below the work surface **54**. The compartments are utilized to provide access to equipment (e.g., the hoist unit **74**), and to stow equipment, tools and the like. With reference to FIGS. **3-5**, the work platform **10** also includes load engaging device compartments **114**. The load engaging device compartments **114** are each sized to receive the load engaging device **46** of a respective hoist apparatus **18**. Each load engaging device compartment **114** can be utilized to support the load engaging device **46** for reeving and unreeving. Utilization of the compartments provides an unobstructed work surface **54** for maintenance personnel that includes an optimized amount of space.

With reference to FIGS. **1** and **6-7**, the work platform **10** includes four suspension supports **118**. each suspension support **118** is secured to a bracket **122** mounted on the work surface **54** using two pins. Each suspension support **118** is movable between a folded position, as shown in FIG. **2** and as shown in dotted lines in FIG. **5**, a hoisting position, as shown in FIG. **3** and as shown in doted lines in FIG. **6**, and a maintenance performing position, as shown in solid lines in FIGS. **1** and **4-8**. A top portion **118***a* of each suspension support **1189** includes a pivotable head having a profile that allow the hoist apparatus **18** to pass over the top (i.e., the suspension supports **118** do not interference with the interaction between the hoist apparatus **18** and the rails **30**). each suspension support **118** includes a horizontal stabilizer **118***b*, a vertical stabilizer **118***e*, and a biasing member **118***d*. the vertical stabilizer **118***c* pivots the top portion **118***a* relative to the remainder of the suspension support **118**. The biasing member **118***d* includes a spring that biases the top portion **118***a* against the vertical stabilizer **118***c*. Contact pads **118***e* on the top portion **118***a* and the horizontal stabilizer **118***b* may include an elastomer or other non-abrasive material to prevent metal-to-metal contact and paint scraping on the girders **22**. As best shown in FIG. **7**, each suspension support **118** also includes a set of hand grips **118***f*. In other embodiments, the work platform **10** may include other types of support members that connect the work platform **10** to the girders **22**. In one such embodiment, the support member(s) may be mounted on the rails **30** fro movement of the work platform **10** relative to the girders **10**. A come-along or other suitable means may be utilized to move the work platform **10** relative to the crane **14**.

As best seen in FIG. **3**, the work platform **10** has a width corresponding to the distance between the girders **22**. That is, the work platform **10** is sized so that the suspension supports **118** are approximately spaced from one another to properly engage the girders **22**. As shown in FIG. **10**, another embodiment of a work platform **200** according to the present invention includes a base **202** whose width can be changed to accommodate various spacings between girders **222**.

The work platform **200** includes a central portion **204** that is connected to suspension supports **218**. The central portion **204** may be connected to the suspension supports **218** through a connecting spacer plate **206** that is sized for the particular girder spread the work platform **200** is to be used on. Depending on the size of the spacer plate **206**, the suspension supports **218** will be closer to or farther away from the central portion **204** of the work platform **200**, thereby changing the overall width of the work platform **200** to correspond to the particular girder spread.

Alternatively, the central portion **204** may be connected to the suspension supports **218** using a hydraulic connection **208**, as shown in FIG. **10**. Actuation of the hydraulic connection **208** moves the suspension supports **218** and the central portion **204** without the need for custom manufacturing spacer plates **206** for the particular girder spread on which the work platform **200** is to be used.

In some embodiments, the work platform **10** or **200** may include bottom support members such as retractable outrigger supports that extend from the work platform **10** to contact the bottom guide of the girders **22**. The bottom support members act as a positive stop when hoisting the work platform **10** to the girders **22**. Bottom support members are particularly useful when hoisting a work platform **10** using a single hoist apparatus **18**. the hoist apparatus **18** can hoist the work platform **10** until the bottom support members are tight against the underside of the girders **22**, thereby providing a stable work surface **54** until the suspension supports **118** are in place.

The work platform **10** is designed as a fluid tight structure to prevent fluids (e.g., water, oil, lubricants, and the like) utilized while performing maintenance from falling through the work platform **10** and to the floor below. the work platform **10** is also designed to prevent objects (e.g., tools, equipment, and the like) utilized while performing maintenance from falling through the work platform **10** and to the floor below. Further, the work platform **10** is designed to utilize removable pins and quick connections for ease of the assembly of removable and/or collapsible components (e.g., handrails **94**, suspensions supports **118**) of the work platform **10**. The pins may include grab handles for ease of removal, and tie chains secured to the work platform **10** to prevent dropping of the pins from the work platform **10**. The removable pins may be stowed in a compartment under the work surface **54** when not being used.

The work platform **10** includes electrical service to allow for utilization of power tools and welding equipment. In one construction, power is connected to the work platform **10** by

means of a cable reel, tag line festoon, or the like. A circuit breaker may be located on the work platform **10** that includes control of all power to the hoist unit **74** and the receptacles located on the work platform **10**.

The work platform **10** includes a control for the hoist unit **74** that allows the maintenance personnel to raise and lower the mast **58** relative to the work surface **54**. In one construction, the hoist unit control includes an isolation transformer and is located in a compartment under the work surface **54** near the mast **58**. A mast control pushbutton station **123** (schematically illustrated in FIG. **4**), with mast on/off and mast raise/lower controls, is electronically connected to the hoist unit control. The mast control pushbutton station **123** may include a cord or wireless connection that allows for operation of the mast **58** from any location on the work surface **54**. The mast control pushbutton station **123** may also include attachment controls (e.g., jib crane attachment controls, drum cradle attachment controls, worker basket attachment controls). In other constructions, the attachments may be alternatively controlled.

The work platform **10** also includes a crane control pushbutton station **124** (schematically illustrated in FIG. **4**) that allows for remote operation of the crane **14**. The crane control pushbutton station **124** is electrically connected to the crane controls. The crane control pushbutton station **124** includes crane on/off, hoist-one raise/lower and forward/reverse, hoist-two raise/lower and forward/reverse, and girders forward/reverse controls. The crane pushbutton station **124** may include a cord or wireless connection that allows for operation of the crane **14** from any location on the work surface **54**. In one embodiment, the normal crane controls are locked-out to only allow operation of the crane **14** using the crane control pushbutton station **124** while the work platform **10** is being utilized to perform maintenance. Pendant controls **224**, as shown in FIG. **10**, may also be utilized, providing a worker with wired control of the work platform **200** from a remote location, such as the ground, a girder **222**, etc.

With reference to FIG. **2**, the work platform **10** is designed to fit through an equipment hatch **126** of a containment building **130**. The illustrated work platform **10** is approximately twelve feet wide, twenty four feet long, four feet deep and weighs approximately twenty-one tons. The equipment hatch **126** is approximately fourteen feet, six inches in diameter. the work platform is brought into the containment building **130** in a collapsed state on an equipment hatch transfer car **134**. the transfer car **134** is supported on a pair of temporary rails **138** that extend into the containment building **130**.

When the work platform **10** is inside the containment building **130**, the removable and/or collapsible components (e.g., handrails **94**, suspension supports **118**) of the work platform **10** are assembled to configure the work platform **10** in an uncollapsed state. Configuration of the work platform **10** in the uncollapsed state may occur before and/or after the work platform is connected to the girders **22**.

In the illustrated embodiment, a respective hoist apparatus **18** (e.g., an auxiliary hoist apparatus of the crane **14**) is utilized to lift the suspension supports **118** from the folded position to the hoisting position. The illustrated suspension supports **118** weigh approximately 400 pounds. the suspension supports **118** may be locked in the hoisting position using the pins. As illustrated in FIG. **6**, the hoisting position is approximately eighty percent of the maintenance performing position. Placement of the suspension supports **118** in the hoisting position allows a maintenance personnel to move the suspension supports **118** the remainder of the way to the maintenance performing position using the hand grips **118***f*. the suspension supports **118** are moved to the maintenance performing position when the work platform **10** is positioned in a hoisted position, as illustrated in FIG. **3**.

According to the work platform **200**, as shown in FIG. **10**, the suspension supports **218** move into position hydraulically (i.e., they hydraulically move from folded positions, to their hoisting positions, to their maintenance performing positions), eliminating the need to use the hoist apparatus **18** and/or manual assistance to move the suspension supports **218** into position. Shoes **210** may or may not be manually adjusted for the particular girder angle and girder geometry. Further, the suspension supports **218** are constructed to include first portions **214** that move within second portions **216** so that the height of the base portion **202** of the work platform **200** can be adjusted relative to the girders **222**. The base portion **202** of the work platform **200** is coupled to the second portions **216** of the suspension supports **218**. therefore, the base portion **202** moves up and down when the first portions **214** move within the second portions **216** of the supports **218**.

As shown in FIGS. **11** and **12**, the movement of the first portions **214** through the second portions **216** of the suspension supports **218** can be utilized to lift the work platform **200** off of the equipment hatch transfer car **134** that may be used to move the work platform **200** into a containment building. When the work platform **200** is positioned within the building and it is desired to move the equipment hatch car out from below the work platform **200**, the base portion **202** of the work platform **200** can be lifted off the equipment hatch transfer car by moving the first portions **214** of the suspension supports **218** through the second portions **216** until the first portions **214** engage the ground beneath the equipment hatch transfer car. Once the first portions **214** have engaged the ground, further movement of the first portions **214** through the second portions **216** will cause the base portion **202** of the work platform **200** to raise off of the equipment hatch transfer car **134**, as shown in FIG. **12**. The equipment hatch transfer car **134** can then be moved on rails **138** out from under the base portion **202** of the work platform **200** while the base portion **202** is "standing" above the equipment hatch transfer car **134** on the first portions **214** of the suspension supports **218**, as shown in FIG. **12**.

In addition to the base **202** of the work platform **202** being movable generally vertically relative to the girders **222** by movement of the first portions **214** of the suspension supports **218** relative to the second portions **216**, the entire work platform **200** may be moved laterally along the girders **222**. Referring particularly to FIGS. **10**, **13** and **14**, the shoes **210** of the suspension supports **218** include a wheel attachment **280** (FIG. **14**) having a first portion **212** and a second portion **213**. The first portion **212** include a support **284** and the second portion **213** is pivotally coupled to the support **284** by a pin **286**. The second portion **213** is movable between a disengaged position (illustrated in FIGS. **10-12**) and an engaged position (illustrated in FIGS. **13** and **14**). A ball screw assembly **288** is coupled to the first portion **212** and engages the second portion **213** when the second portion **213** is in the engaged position. A wheel **215** is coupled to a projection **290** of the second portion **213** for rotation about a pin **292**.

When it is desired to hold the work platform **200** fixed with respect to the girders **222**, the first portions **212** are engaged with the upper surface of the girders **222** in a manner similar to that discussed above with respect to the suspension supports **218**, and the second portions **213** are rotated to the disengaged positions as illustrated in FIGS. **10-12**. However, if it is desired to move the work platform **200** laterally along the girders **222**, the second portions **213** of the shoes **210** are

rotated about the pin **286** so that the wheels **215** engage the respective upper surfaces of the girders **222**. With the wheels **215** engaging the girders **222**, the second portion **213** is pulled closer to leg **214** by rotation of the ball screw assembly **288**. Rotation of the ball screw assembly **288** lifts the first portion **212** off of the girders **222** such that the work platform **200** is supported by the wheel **215**. When each of the wheels **215** are resting on the upper surfaces of the girders **222**, the work platform **200** is free to roll along the upper surfaces of the girders **22** on the wheels **215**.

Some or all of the wheels **215** can be driven for automatic movement of the work platform **200** along the girders **222**. Alternatively, the wheels can simply be mounted for free rotation requiring external force (e.g., a manual force) to move the work platform **200** along the girders **222**. similarly, the balls crew assemblies **288** may be driven for automatic lifting of the first portion **212** from the girders **222**, or the ball screw assemblies **288** may be adjusted manually.

Referring back to FIGS. **1** through **8**, when the work platform **10** is ready to be hoisted, the load engaging devices **46** of the hoist apparatus **18** are lowered and connected to the hook linkages **106**. When each load engaging device **46** is securely connected, the motors **50** are driven to turn the drums **38** in the wind-on direction. The work platform is hoisted up to the girders **22** (i.e., to the hoisted position). Hoisting the work platform **10** for placement on the crane **14** using the crane **14** eliminates the need for other lifting equipment. In other constructions, the work platform **10** my be hoisted to the girders **22** using fewer or more hoist apparatus **18**.

While the work platform **10** is still supported by the hoist apparatus **18**, the suspension supports **118** are connected to the girders **22** (i.e., moved to the maintenance performing position). The horizontal stabilizers **118***b* are adjusted to center the work surface **54** between the girders **22**. the vertical stabilizers **118***c* are adjusted to level the work surface **54**. The suspension supports **118** may be utilized to fully support the work platform **10**. In other embodiments, the load engaging devices **46** may remain connected to the hook linkages **106** to provide additional support. Once the work platform **10** is stabilized, the wing plates **98** are pivoted in position against the girders **22** (FIG. **3-5**) to prevent objects from falling between the work platform **10** and the girders **22**.

When the work platform **10** is in the maintenance performing position, as illustrated in FIG. **4**, the maintenance personnel can begin to perform the necessary maintenance.

In one embodiment, maintenance may include the replacement of the hoist drum assembly **64**. The drum cradle attachment **62** is connected to the mast **58** and moved into position under the hoist drum assembly **64**. The crane control pushbutton station may be utilized to position the hoist apparatus **18** above the mast **58**. Further, the longitudinal adjustment feature of the drum cradle attachment **62** may be utilized to position the drum cradle attachment **62** directly below hoist drum assembly **64**. The mast **58** is then raised vertically and the hoist drum assembly **64** is lifted from its bearing seats. When the hoist drum assembly **64** is clear of the remaining components of the hoist apparatus **18**, the crane control pushbutton station **124** is utilized to move the remaining components of the hoist apparatus **18**. The drum cradle attachment **62** is then rotated ninety degrees so the drum axis is parallel to the girders **22**. The mast **58** is lowered to bring the drum cradle attachment **62** near the wok surface **54**. The hoist drum assembly **64** can then be lowered off the work platform **10** using an existing hoist apparatus **18** or, alternatively, a listing device(s) that is temporarily supported by the crane **14** or structure adjacent to the crane **14**.

The work platform **10** provides a convenient means to work high in the air, while virtually eliminating the possibilities of objects and/or fluids falling to the ground. The work platform **10** includes the ability to lift heavy pieces on to and off of the crane **14**. The work platform **10** also allows for the operation of power tools and welding equipment. Additionally, the crane **14** can be remotely operated from the work platform **10**, and the work platform **10** does not interfere with operation of the crane **14**.

The embodiments described above and illustrated in the figures are presented by way of example only and are not intended as a limitation upon the concepts and principles of the present invention. As such, it will be appreciated by one having ordinary skill in the art that various changes in the elements and their configuration and arrangement are possible without departing from the spirit and scope of the present invention as set forth in the appended claims.

What is claimed is:

1. A method of implementing a work platform for an overhead crane, the overhead crane including a support structure that supports a hoist above the ground and the work platform including a base and a first support member, the first support member including a vertically extending first portion that has a shoe secured at its upper end, wherein the first portion vertically moves within a second portion coupled to the base so that the base moves up and down relative to the first portion of the first support member when the first portion of the support member vertically moves within the second portion of the first support member, the method comprising the steps of:

moving the work platform on a car into a space serviced by the overhead crane;

engaging a lower end of the first portion of the first support member with the ground about the car by downwardly moving the first portion of the first support member within the second member of the first support member;

lifting the work platform off of the car by further downwardly moving the first portion of the first support member within the second member of the first support member; and

after the work platform is lifted off the car, moving the first support member to engage the shoe with the support structure to support the work platform on the support structure.

2. The method according to claim **1**, further comprising the step of moving the car out from under the work platform.

3. The method according to claim **1**, wherein a second support member is engaged with the ground around the car along with the first support member and moving the base of the work platform along the second support member, as well as along the first support member, to lift the work platform off of the car.

4. The method according to claim **3**, wherein third and fourth support members are engaged with the ground around the car along with the first and second support members and moving the base of the work platform along the third and fourth support members, as well as along the first and second support members, to lift the work platform off of the car.

5. The method according to claim **1**, further comprising the step of moving the first portion of the first support member up and down within the second member of the first support member to move the base up and down relative to the support structure while the work platform is supported on the support structure.

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